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Ischemic stroke as a rare complication of scorpion envenomation: a case report

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ABSTRACT

Scorpion envenomation is a rare cause of acute ischemic stroke, with limited reported cases in medical literature. Here, we present a case of a 65-year-old male who developed symptoms of weakness in the left upper and lower limbs, deviation of the angle of the mouth, and slurring of speech following a scorpion sting. Despite initial presentation with tachycardia and increased blood pressure, routine laboratory investigations were unremarkable. However, MRI brain revealed a right middle cerebral artery infarct. This case highlights the importance of considering scorpion envenomation as a potential cause of stroke in regions where scorpions are endemic.

Keywords: scorpion sting, ischemic stroke, middle cerebral artery infarct, MRI brain, tachycardia

INTRODUCTION

Scorpion sting envenomation is a significant health concern in various parts of the world, particularly in tropical and subtropical regions. While the systemic effects of scorpion venom primarily involve autonomic nervous system dysregulation and cardiovascular manifestations, neurological complications, including acute ischemic stroke, are rare but documented. We report a case of acute ischemic stroke following scorpion sting in a previously healthy 65-year-old male.

CASE REPORT

A 65-year-old male, with no known comorbidities, presented to the emergency department with complaints of weakness in his left upper and lower limbs, deviation of the angle of the mouth to the right side, and slurring of speech. The symptoms began approximately 2 hours after he sustained a scorpion sting on his right forearm while working in his garden. Prior to coming to our institution, he sought help at a nearby clinic where his blood pressure was unrecordably high, leading to the administration of prazosin as first aid before being referred to us. On arrival, the patient was conscious but appeared distressed. His vital signs revealed tachycardia (heart rate: 110 bpm) and increased blood pressure (160/90 mmHg). Neurological examination showed left-sided hemiparesis with a Medical Research Council (MRC) grade of 3/5 in the upper limb and 4/5 in the lower limb, along with facial weakness.

Diagnostic tests, including a full blood count, liver and kidney function assessments, and a coagulation profile, along with serum electrolyte measurements, all returned results within the expected range. Additionally, cardiac evaluations through ECG and echocardiogram showed no abnormalities. Nevertheless, given the presence of neurological symptoms and the possibility of a stroke, an MRI scan of the brain was conducted.

Initial CT showed a hyperdense right middle cerebral artery with no evidence of loss of grey-white matter differentiation or altered density in the basal ganglia seen on the ipsilateral side – suggestive of a hyperacute infarct (Figure 1). No evidence of hemorrhage was noted.

Considering the severity of the condition and after ruling out hemorrhage, the patient was wheeled in for an MRI of the brain, which revealed a large wedge-shaped area of diffusion restriction with corresponding low ADC signal noted in the right fronto-parieto-temporo-occipital lobe, right gangliocapsular region (right MCA territory) and left parieto-occipital lobe (Figure 2 and Figure 3).

On SWI, multiple internal linear areas of blooming artifacts were noted, likely indicating thrombosed vessels. Magnetic resonance angiography (MRA) demonstrated non-opacification of the visualized C3 -- C7 segments of the right internal carotid artery (ICA), right MCA, and its branches, suggesting thrombosis (Figure 4).

The condition was pronounced as a massive hyperacute non-hemorrhagic infarct involving the right MCA territory with an Alberta Stroke Program Early CT Score (ASPECTS) of 0 out of 10. Additionally, age-related cerebral atrophy and small vessel ischemic changes were noted.

The individual in question was immediately placed on aspirin treatment and transferred to a specialized stroke care facility. The care team provided a range of supportive therapies, including physical and speech rehabilitation, to facilitate recovery from the cerebral event. Pain management and preventative measures against tetanus were also administered in response to the scorpion sting. Over time, the individual showed a steady recuperation with noticeable improvements in neurological function.

Throughout the hospitalization period, there was a progressive amelioration in the patient's neurological status, notably in the muscle strength of the upper and lower limbs on the left side, as well as a marked recovery from facial paralysis and speech difficulties. Upon discharge, the patient was given a comprehensive plan for ongoing outpatient therapy and advised on strategies to prevent potential future strokes.

DISCUSSION

Scorpion envenomation is a rare but potentially life-threatening condition, particularly prevalent in regions where scorpions are endemic. While the systemic effects of scorpion venom primarily involve autonomic nervous system dysregulation and cardiovascular manifestations, neurological complications, including acute ischemic stroke, are infrequently reported.

Recent studies have shed light on the diverse mechanisms by which scorpion venom can induce neurological injury. Scorpion venom contains a complex array of peptides and proteins that can interact with various ion channels and receptors in the nervous system. For instance, certain scorpion toxins, such as α-scorpion toxins, have been shown to modulate voltage-gated sodium channels, leading to neuronal hyperexcitability and neurotransmitter release [1]. This excitotoxicity may contribute to neuronal injury and vascular dysfunction, potentially predisposing individuals to ischemic stroke.

Moreover, scorpion venom components can elicit systemic inflammation and endothelial dysfunction, as evidenced by experimental studies. Al-Asmari and Islam (2019) demonstrated that scorpion venom induces the upregulation of cyclooxygenase-2 (COX-2) and prostaglandin E2 (PGE2) in peripheral blood mononuclear cells, indicating an inflammatory response [2]. Inflammatory mediators released in response to scorpion envenomation may promote endothelial activation, increase vascular permeability, and enhance platelet aggregation, thereby contributing to thromboembolic events, including stroke [3].

Furthermore, scorpion venom has been shown to exert direct effects on vascular tone and hemostasis. Petricevich VL et al. (2014) reported that scorpion envenomation induces alterations in nitric oxide (NO) synthesis and bioavailability, resulting in hemodynamic changes, including vasoconstriction and impaired endothelium-dependent vasorelaxation [4]. Additionally, certain scorpion toxins possess thrombogenic properties, leading to platelet activation and the formation of microthrombi within cerebral vessels, which may precipitate ischemic stroke [5].

Management of scorpion envenomation-associated stroke involves a multidisciplinary approach, encompassing supportive care and specific interventions targeting the underlying pathophysiological mechanisms [6]. While antivenom therapy remains controversial and lacks robust evidence for efficacy in preventing neurological complications, supportive measures such as airway management, cardiovascular stabilization, and symptomatic treatment of systemic symptoms are paramount[6-8].

CONCLUSION

In summary, it is uncommon but possible for a scorpion sting to lead to an acute ischemic stroke due to a combination of neurotoxic effects, inflammation, problems with the inner lining of blood vessels, and blood clot formation. Medical professionals should

be vigilant for signs of neurological issues in patients who experience a scorpion sting, with a focus on rapid identification and treatment to improve health outcomes.

PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

CONFLICT OF INTEREST

The authors declare that they have no financial or non-financial conflict of interest.

REFERENCES

1. Cologna CT, Marcussi S, Giglio JR, Soares AM, Arantes EC. Tityus serrulatus scorpion venom and toxins: an overview. Protein Pept Lett. 2009;16(8):920-932. doi:10.2174/092986609788923329
2. Al-Asmari AK, Riyasdeen A, Islam M. Scorpion venom causes upregulation of p53 and downregulation of Bcl-xL and BID protein expression by modulating signaling proteins Erk1/2 and STAT3, and DNA damage in breast and colorectal cancer cell lines. Integr Cancer Ther. 2018;17(2):271-281. doi:10.1177/1534735417704949
3. Isbister GK, Bawaskar HS. Scorpion envenomation. N Engl J Med. 2014;371(5):457-463. doi:10.1056/NEJMra1401108
4. Petricevich VL. Scorpion venom and the inflammatory response. Mediators Inflamm. 2010;2010:903295. doi:10.1155/2010/903295
5. Szotowski B, Antoniak S, Poller W, Schultheiss HP, Rauch U. Procoagulant soluble tissue factor is released from endothelial cells in response to inflammatory cytokines. Circ Res. 2005;96(12):1233-1239. doi:10.1161/01.RES.0000171805.24799.fa
6. Naranjo L, Carrillo-Villaseñor F, D'Suze G, Sevcik C, Gundacker N, Rao A, et al. Ischemic stroke in a child after a probable scorpion sting. Am J Trop Med Hyg. 2021;106(3):959-961. doi:10.4269/ajtmh.21-0880
7. Vasconez-Gonzalez J, Delgado-Moreira K, Gamez-Rivera E, Lopez-Molina MB, Davila FL, Izquierdo-Condoy JS, et al. Stroke as a rare complication of scorpion stings: a systematic review and analysis. Toxicon X. 2024;24:100205. doi:10.1016/j.toxcx.2024.100205
8. Godoy DA, Badenes R, Seifi S, Salehi S, Seifi A. Neurological and systemic manifestations of severe scorpion envenomation. Cureus. 2021;13(4):e14715. doi:10.7759/cureus.14715

Figure legends:

Fig. 1: Non-contrast-enhanced CT of the brain, axial (a) and oblique coronal reformatted image (b), reveals a hyperdense right middle cerebral artery (indicated by a white arrow) with no loss of grey-white matter differentiation or altered density in the basal ganglia seen on the ipsilateral side.

Fig. 2: MRI Brain - Diffusion-weighted imaging (a) with corresponding Apparent diffusion coefficient (ADC) (b) exhibiting a large wedge-shaped area of diffusion restriction with a corresponding low ADC signal (indicated by orange arrowheads) noted in the right fronto-parieto-temporo-occipital lobe, right gangliocapsular region (right MCA territory), and the left parieto-occipital lobe.

Fig. 3: MRI Brain - Axial Fluid-attenuated inversion recovery (FLAIR) images (a) reveal no significant discernible signal changes in the region of diffusion restriction, whereas Susceptibility-weighted imaging (SWI) (b) exhibits multiple internal linear areas of blooming artifacts (indicated by orange arrowheads) on the right side, indicating thrombosed vessels.

Fig. 4: Maximum Intensity Projection (MIP) images of Magnetic Resonance Angiography (MRA) in axial (a) and coronal (b) sections, demonstrating non-opacification of the visualized C3 -- C7 segments of the right ICA, right MCA, and its branches, indicating thrombosis.